FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

FEB 29 1996

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IN REPLY REFER TO:
9600685

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MAR - 1 1996
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Mr. David Fichtenberg
4825 South Graham Street
Seattle, Washington 98118

Dear Mr. Fichtenberg:

This letter is in response to your letter to Senator Murray, dated December 10, 1995, which was forwarded to the Federal Communications Commission. In your letter you state concerns regarding Section 107 of the Telecommunications Bill HR 1555, which provides a Federal preemption of State and local regulations regarding the placement of personal wireless facilities based on environmental effects of radiofrequency emissions.

The National Environmental Policy Act of 1969 (NEPA) requires agencies of the Federal Government to evaluate the effects of their actions on the quality of the human environment. To meet its responsibilities under NEPA, the Commission has adopted environmental factors for human exposure to RF energy emitted by FCC-regulated transmitters and facilities.

The Commission's environmental rules are intended to ensure that, consistent with NEPA, any FCC-regulated transmitters and facilities that expose the public or workers to levels of RF radiation that are considered by expert organizations to be potentially harmful undergo environmental evaluation. The Commission, however, is not the expert agency for evaluating the effects of RF radiation on human health and safety. Therefore, it uses guidelines, based on ANSI C95.1-1982, developed by those with appropriate expertise.

The FCC has required radio facilities to meet RF exposure guidelines developed by expert organizations since 1985. This includes all facilities operating in the cellular and personal communications services. In ET Docket 93-62, the Commission proposed to adopt the more recent ANSI/IEEE C95.1-1992 guidelines for human exposure to radio-frequency (RF) radiation in lieu of the ANSI C95.1-1982 guidelines. In this proceeding, the Commission received comments from expert health and safety agencies within the Federal Government, including the U.S. Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH). In its comments, the EPA expressed its belief that the FCC should not adopt the ANSI/IEEE C95.1-1992 guidelines in their entirety. Instead, the EPA preferred the adoption of a combination of guidelines consisting of power density exposure limits developed by the National Council of Radiation Protection and, the low-power device, induced, and contact guidelines of ANSI/IEEE C95.1-1992. The Commission is considering all comments submitted with respect to this issue and has not yet made a decision on which guidelines to adopt.

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In addition to commenting on appropriate guidelines, numerous entities filed comments, including two Petitions for Rule Making, requesting a Further Notice of Proposed Rule Making to address federal preemption of non-federal government regulations concerning RF radiation hazards. These commenters allege generally that the non-federal guidelines are unnecessarily restrictive and make establishing communications services prohibitively expensive, technically difficult and in some cases impossible. Prior to Commission action on this issue, however, Congress, recognizing the need for a uniform set of RF exposure guidelines as they affect the siting of certain communications facilities, mandated that no State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of environmental effects of radio-frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions.

You raise the possibility that service to areas not presently covered by terrestrial-based mobile communications networks will be provided by satellite networks within the next five years. You argue, therefore, that preemption of State and local RF exposure guidelines is not necessary to assure universal service and that Congress should withhold action for at least seven years prior to making a decision on this issue. While it is true that a number of companies are developing satellite systems intended to provide a broad range of mobile services to business and individuals, it is not generally considered that these satellite networks will be a substitute for terrestrial services. Rather, it is likely that terrestrial and satellite services will complement one another to form a network of services offered by competing providers. In order to create such a competitive environment and to provide sufficient spectrum to meet the immediate demand for an increasing variety of wireless services, it is important that we not unnecessarily restrict the growth of one service based on the anticipated development of a future service.

Congress, in the Telecommunications Act of 1996, has also mandated that, within 180 days after the enactment of the Act, the Commission shall complete action in ET Docket 93-62 to prescribe and make effective rules regarding the environmental effects of radio-frequency emissions. The Commission fully intends to conclude action on the ET Docket 93-62 within the time frame specified by Congress.

If you have further questions or concerns, please address them to the FCC's RF-Safety Program at (202) 418-2464, via the internet at http://www.fcc.gov/oet/, or:

Attention: RF Safety Program
Federal Communications Commission
Office of Engineering & Technology
1919 M Street, N.W.
Washington, DC 20554

In addition, if you have specific questions with respect to the biological effects of radio-frequency energy you may wish to contact:

Norbert Hankin
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
(202) 233-9235

Sincerely,

Richard M. Smith
Chief
Office of Engineering & Technology

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Washington, D.C. 20460
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Sincerely,

Richard M. Smith
Chief
Office of Engineering & Technology

United States Senate

Washington, D.C. Feb 5 , 19 96

OET

Respectfully referred to 93-62

FCC 685

We received the enclosed letter from a constituent. Please respond to Mr. Fichtenberg directly

Patty Murray

U.S.S.

David Fichtenberg
4825 South Graham Street
Seattle, WA 98118

1995 DEC December 10, 1995

Honorable Senator Patty Murray
State of Washington
Senate
Washington D.C.

Dear Senator Murray,

Re: Legislation adverse to local control of zoning and environmental health standards in Telecommunications bill HR 1555, Section #107

I hope you will consider the enclosed information, and also hope you will consider bringing the enclosed concers to the attention of Senator Slade Gorton and Representative Rick White, the Washington members of this conference committee, as well as the other members of this conference committee, especially House Commerce Chairman Thomas Bliley and Senate Chairman of Commerce, Science and Transportation Larry Pressler.

Section 107 of HR 1555 preempts local zoning authority and local authority to set more protective radiofrequency health standards than the FCC may chose. Enclosed please find a 4 page summary of my understanding of the relevant issues.

Especially important is to take into account that any gaps in universal service due to incomplete coverage of ground-based mobile transmission facilities may be filled by satellite systems for which service is anticipated over the next 5 years. Therefore, it seems at least 7 years should be allowed before Congress evaluates whether regulation is needed to assure universal coverage.

I would much appreciate your thoughts on the above and what action you believe most helpful.

Thank you.

David Fichtenberg

Sincerely yours,

Note: If you are in contact with a physician or physician group in the Puget Sound area of Washington State and on whose judgment you put weight, I would be pleased to discuss the health effects matters with them - I have found that in general the medical community is unaware of much of the research I have found through literature review.

Enclosures:
1. Article from USA Today showing that satellite telecommunications are expected to provide service soon (1998-2001), within 2 to 5 years, and may be able to fill gaps in ground-based systems so federal regulation to achieve universal service may not be needed.

Regulation to assure interconnection of services may be needed.

2. 2 page legal size background letter about the legislation and some adverse health effects including cancer, brain damage, fetal loss

3. EPA letter to FCC advising **against** adopting the ANSI standard (in ET Docket 93-62) noted in Section 107 of HR 1555

4. EPA letter noting that it is aware of no level below which there are no non-thermal biological effects of radiofrequency as may come from cellular base stations.

5. Essay on biological effect of microwave radiation by Dr. Cletus Kanavy, past chief of the biological effects group of the Philips Laboratory Electronic Effects Division at Kirkland Air Force Base, New Mexico, October 1992. + Encyclopedia Britannica article.

6. Text of HR 1555 section 107, and Moran amendment that only partially addresses improper pre-emption by FCC of zoning, and leaves standing improper pre-emption of environmental health standards

7. Report of Dr. Neil Cherry of Lincoln University, Christchurch, New Zealand reviewing concerns on adverse effects

8. Some scientific papers showing adverse effects.

9. Section 5.7: Melatonin and Other Hormones, pages 5-59 to 5-63 from the draft EPA document Evaluation of the Potential Carcinogenicity of Electromagnetic Fields, and which shows that "No data were found" for studies of modulated radiofrequency and night time production of melatonin.

P.S. Re: Need for research at telecommunications frequencies and transmission patterns

To help protect both the capital investment of American industry and the health of the public, I believe it is imperative that extensive studies be made evaluating the environmental health effects of the radiofrequency exposures from telecommunications mobile base station transmission facilities. In this way, adverse effects can soon be documented and alternative transmission frequencies or patterns can be found that are safer.

While it is very tempting to want to pretend that very low-dose chronic radiofrequency emissions do not have biological effects, research findings continue to suggest otherwise. When the FCC licensed cellular frequencies about 15 years ago and Personal Communication Services frequencies recently, no one had considered whether some frequencies may have biological effects. Its no one's fault. It happened. If effects are found, I hope Congress soon will find ways to assist some telecommunications companies to move to frequencies and transmission patterns that may have less health impact. The sooner such health implications are found and changes made, then the less costly it will be for industry and the public, and the less will be industry resistance and lobbying efforts to prevent change to safer transmission frequencies and patterns.

To undertake the needed research federal funds will likely be needed. I understand that the RAPID program established by Congress in 1992 distributes appropriations through the Department of Energy. I understand the **DOE is mainly focusing research on electric power line frequencies (60 cycles per second), and not on radio frequencies of many millions of cycles per second.** When I speak to researchers at the EPA and elsewhere, I am told little research funds are available, and that the once extensive research on low-dose chronic radiofrequency effects has almost disappeared.

Could you please investigate whether appropriate research is being done at radiofrequency and for base-station exposures.

o No research on the effect of mobile telecommunications base stations on decreased night time melatonin production.

I am especially concerned that one of the most plausible sources of adverse health effects from mobile transmission is not being investigated at all. This is the possible effect radiofrequency may have during the night on stimulating the retina of the eyes to send a signal to the pineal gland which would decrease production of night time melatonin; melatonin has been found to be protective against cancer (please see end of the 4 page background letter enclosed)

The eye is one of the body's most sensitive organs to electromagnetic fields. For the eye to perceive radiofrequency signal at night as "light" would cause no damage, just as visible light causes no damage. However, even the mere detection of "light" can cause melatonin production to drop and thus there can be a reduction in its protective properties against developing some cancers.

Hence, via the "melatonin hypothesis" radiofrequency signals need not cause any "damage", but rather would only need to be "detected" by the body.

To help document the lack of information the effect of modulated radiofrequency fields on melatonin production, I include Section 5.7: Melatonin and Other Hormones, pages 5-59 to 5-63 from the draft EPA document Evaluation of the Potential Carcinogenicity of Electromagnetic Fields. Notice that "No data were found" for studies of modulated radiofrequency. Please assure such studies are done on the effects of night time production of melatonin. Thank you.

(#1

VIA SATELLITE

USA TODAY

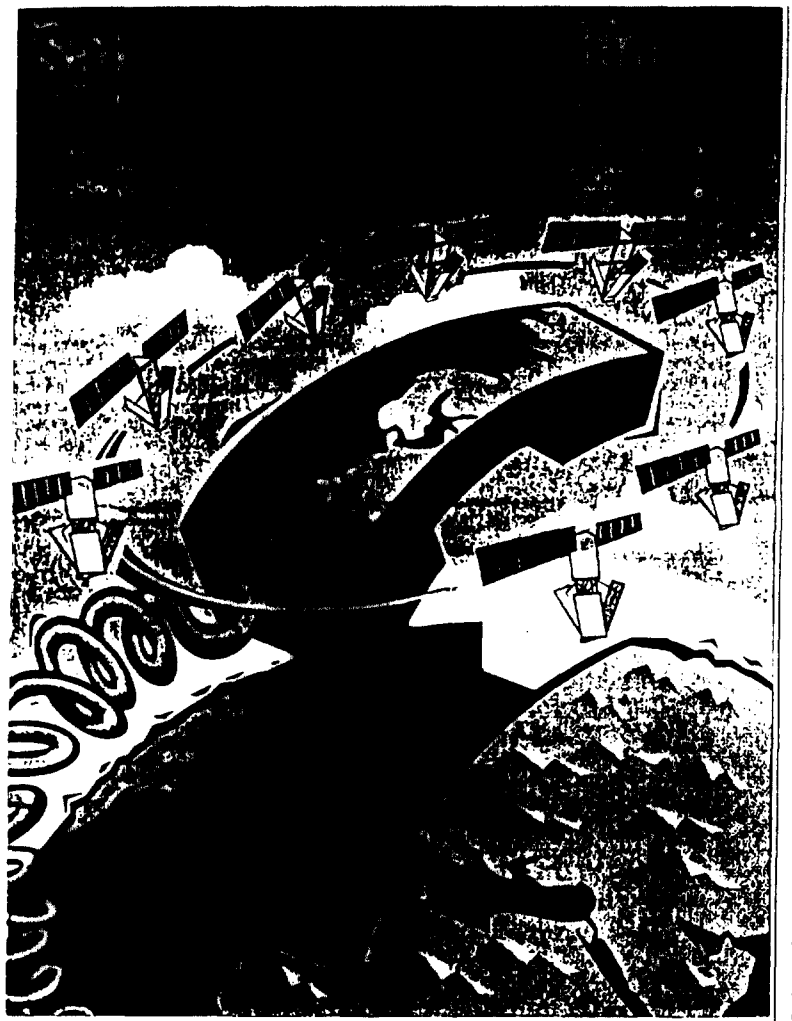
Money

TUESDAY, NOVEMBER 21, 1995

MONEYLINE

A QUICK READ ON THE TOP MONEY NEWS OF THE DAY

11/21/95
USA TODAY
page B1



By Raven Rachin, USA TODAY

Kerkorian wants to recast Chrysler board

By Michael Clements
USA TODAY

Kirk Kerkorian wants to bump the former chairman of Kmart off Chrysler's board of directors to make room for his top aide, Jerome York.

In a meeting with Chrysler executives in New York Monday, Kerkorian suggested Joseph Antonini be dropped from the board when his term expires next year. Antonini was forced out as chairman of Kmart in March.

After the meeting, Chrysler said only that it will continue to review how it is run.

York also told Chrysler that Kerkorian's Tracinda holding company will file proxy solicitation forms with the Securities and Exchange Commission to meet a Dec. 3 deadline. That would let Tracinda field a slate of candidates for the board. York says Tracinda has no plans now to launch a proxy fight but hasn't ruled one out.

Separately, Fidelity Investments, the mutual fund company, says it increased its stake in Chrysler the third quarter to 14.4%, making it the automaker's largest shareholder. Kerkorian controls about 14%.

COVER STORY

Telecom giants enter crowded, high-cost race

Space-age ventures will reach more customers

By David J. Lynch
USA TODAY

Some of the biggest names in telecommunications have embarked upon a very expensive game of musical chairs.

Betting that global demand for communications is outgrowing ground-based networks, telecom giants are building multibillion-dollar satellite constellations. The systems — sporting space-age names such as Astrolink and Globalstar — tout ubiquitous voice, data, paging and fax services for customers around the world. "I don't think people fully appreciate the demand and growth in this market in the 21st century," says Russ McFall, president of Lockheed Martin's Astrospace Commercial unit. "It's going to explode big time."

Maybe. But satellite communications plans are starting to stack up like rush hour on a Los Angeles freeway. Almost three dozen programs — totaling more than 1,500 satellites — are in the works. That's almost five times the number of commercial communications satellites launched since the first, AT&T's Telstar, in 1962.

The price tag for these ventures: $43 billion, says the Communications Center consulting firm in Clarksburg, Md. Yet it doesn't look as if there'll be enough of a market to go around. Cambridge, Mass.-based Pyramid Research forecasts annual revenue of just $5 billion to $12 billion in 2005.

Please see COVER STORY next page ▶

You must return on Saturday.

The tickets require a one-day advance purchase and are non-refundable.

Airlines are using the fares to go to charities in Denver and Chicago.

▶ A round-trip flight between Boston and Chicago on American inating the Saturday-night stayover requirement on some discount fares because the holiday falls on a Monday.

1995 Chrysler Cirrus

Source: *Motor Trend*

Ford

Hot wheels: 1958 Ford Thunderbird.

COVER STORY

Telecom giants race for the stars, systems

Continued from 1B

"The competition out there is going to be pretty stiff," says Pyramid President William Ambrose. "A number of these (projects) are going to fall by the wayside."

To satellite fans, space represents the next step in wireless communications. Satellites offer greater capacity than traditional networks for delivering huge amounts of data. They have the ability to reach customers in remote locales where it's too expensive to place phone lines or cellular towers. And for some systems, the cost to consumers — about 50 cents a minute for Globalstar — would be competitive with cellular phone rates.

"What space can bring is a low-cost solution and instant infrastructure," says GM Hughes Electronics Chairman Michael Armstrong. "Once the satellite is up, it has instant access" to customers.

Though different in important details, all the satellite systems generally work the same way. A unit on the ground takes a user's voice or data and digitizes it — turning it into computer language of ones and zeros. That signal is beamed to a satellite, which passes it to the user on the other end.

Three markets — business travelers, corporations that need speedy data transmission, and underdeveloped countries — will demand more than traditional wire-line or cellular service can provide. More than half of the people on Earth live more than two hours from the nearest telephone, notes Russell Daggatt, president of Teledesic, Microsoft CEO Bill Gates' satellite venture.

The 39 million Americans who work at home on personal computers also are potential customers for networks such as GM Hughes' Spaceway and Lockheed's Astrolink. AT&T's contender, dubbed Voicespan, will speed faxes at 30 pages per minute — five times the pace of conventional phone systems.

Global market estimates range from 30 million to 40 million potential users by early in the 21st century. Steve Dorfman, president of Hughes' space and telecommunications unit, forecasts annual growth in demand for satellite services of 10%.

Fueling the push for spaceborne communications: 10 consecutive years of declining Pentagon spending. With the Cold War's end, satellite makers Lockheed, TRW and Hughes, and communications equipment manufacturers, such as Motorola and Raytheon, have seen military orders wither. Commercial markets represent their best hope for keeping assembly lines humming.

That's the good news. The bad news: Skeptics say cellular will be everywhere it's needed by the time the space phones are turned on. This year, cellular customers topped 30 million vs. just 340,000 10 years ago. "Within two years, you'll be able to get cellular service in any major city of the world," says consultant Hershel Shosteck in Wheaton, Md.

So far, Wall Street has sided with the skeptics. Satellite initial public offerings have disappointed. Panamsat, which plans to launch three satellites in early 1997, trades just above its Sept. 21 offering price of $17 a share. Likewise, Globalstar Telecommunications was forced to cut its Feb. 22 offering price to $20 a share after hoping for $24 to $26. After languishing all year, it closed Monday at $21¾.

After investors balked, Globalstar partners Loral and Qualcomm withdrew a $400 million debt offering Oct. 3. Two weeks earlier, Motorola yanked a $300 million offering for its 66-satellite Iridium network. Now, Iridium plans to tap its existing investors for more cash. Globalstar has secured $250 million in financing from Chemical Bank.

"This is VHS vs. Beta," says satellite expert John Pike. "No one has a clue which one of these solutions is going to turn out to be the one that makes money."

Satellite salesmen are undaunted. Iridium's Leo Mondale says his consortium might launch its first satellite in mid-1996, several months ahead of schedule. Globalstar says it's on schedule for first launch in 1997 and initial service on a 48-satellite network the following year.

There also was no shortage of applicants when the Federal Communications Commission recently solicited proposals for "broadband" satellites, which are capable of handling the bulkier signals associated with video or multimedia in addition to voice and text. Lockheed Martin, General Electric, AT&T, Motorola and GM Hughes Electronics all want to build these giant skyways. The FCC expects to award a limited number of licenses by mid-1996, says FCC attorney Karl Kensinger.

Still, even if demand materializes, there's a surplus of competitors, analysts say. Key worries: cost, politics and competition from traditional cellular service.

"I don't think the market will be anywhere close to supporting (several) systems," says Columbia University professor Eli Noam. "There's probably room for one or two of these."

Spacecraft aren't cheap: Teledesic, backed by the bottomless pockets of Gates and cellular pioneer Craig McCaw, is projected to cost at least $9 billion.

But to erect globe-girdling networks, diplomatic skills will be as valuable as fat bankrolls. Before satellite promoters sign a single customer, they must get regulatory approval from the FCC and international agencies, plus individual OKs from up to 200 countries.

In China, that means assuring an authoritarian government it will control the network in a crisis. In Germany, it means placating a state telephone firm dependent upon international phone calls for revenue. In dozens of countries, companies have formed alliances with local telecom operators and equipment makers to blunt opposition. The latest: Iridium's Nov. 10 announcement it would offer shares to foreign firms.

In fact, U.S. equipment makers — many of whom helped finance the satellite programs — will profit greatly if the space networks are built. And they risk comparatively little if the projects fail. Qualcomm, which owns 7.9% of the Globalstar venture, has contributed just $6 million to the project. In 1994, it received from Globalstar the largest development contract in its history, a $266 million order for handsets and ground stations. "It's genius. They created a market for themselves," says Pyramid's Ambrose.

As for the long haul, Shosteck says the satellite projects might be financially viable — but only if they go bankrupt and new owners purchase them for pennies on the dollar.

Harsh? Sure. But executives already predict some competitors will join forces or drop out. "The demand is there," says Thomas Gage of Gemini Consulting in McLean, Va. "I do not believe the demand is there for multiple systems."

All services may not get off ground

Competition is growing among companies eager to offer satellite-delivered voice, data, paging and fax services. But analysts predict a shakeout.

Project name	Principal partners	Est. cost	Service begins
Globalstar	Loral/Qualcomm	$2 billion	1998
Iridium	Motorola	$3.4 billion	1998
Astrolink	Lockheed Martin	$4 billion	2000
Odyssey	TRW/Teleglobe	$2 billion	2000
Spaceway	GM Hughes	$3.2 billion	2000
Voicespan	AT&T	N/A	2000
Teledesic	Gates/McCaw	$9 billion	2001

N/A - not available

Source: Company reports

al government si

One of the mo monthly empl could be held up several days beyond the Dec. 8 scheduled release date.

The week-long telephone survey of 60,000 households conducted by the Labor Department each month was scheduled to b President Clin agreed to end th

Now this mon begin today and until next wee Thanksgiving ho

"We're going t catch up," Labo Reich says. "Ho be too much dar

Investors, pol ness executives ports to make de stocks, the direc or ordering supp

Most of the r by the shutdown

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▶ October h building permit at 8:30 a.m. ET partment says.

▶ October fe probably will be p.m. ET, the T says. They were

▶ September day, will be rel 8:30 a.m. ET.

A Commerce estimated that would be back

That's just in deadline Presid gress set Sunday budget impasse the government

▶ Federal work

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VL

Request to Remove Parts of Congressional Telecommunications Bill HR 1555, Section 107 which prevent free markets, forces national zoning regulations on local jurisdictions, and prevents local jurisdictions from setting more protective environmental health protection standards
December 10, 1995

What do your constituents want? Is not local control a concern that has set the tone for many of the legislative initiatives of the 104th Congress? Does not this tone include maintaining the ability of local jurisdictions to have authority on local concerns such as zoning and environmental health standards?

If this is the concern of Congress, then why include parts of Section 107 of HR 1555 of the Telecommunications Bill now in Conference which

- **manipulates and prevents free enterprise, prevents free markets, may lower property values,**
- **forces local jurisdictions to be compelled by a FCC national zoning board, and**
- **forces *pre-emptive* environmental health standards imposed by the FCC which prevent local jurisdictions from making more protective standards, and which standard the EPA is against adopting.**

Is this increased federal control over local zoning and health standards, control which may lower property values, spoil views, and possibly increase health risks and increase electrical interference with hearing aids and sensitive medical devices - what your constituents want?

Moreover, why limit local jurisdiction when there are some human and animal studies suggesting there can be serious **adverse health effects including cancer promotion, fetal loss, and brain damage** among others?

o Satellites may be the solution to provide for free enterprise, free market forces, universal service + local control of zoning and health standards. Satellites

- will not be unsightly or 'mar' home views,
- will not raise the concern of reduced property values,
- will not expose residential and school areas to the higher radiation of ground based systems
- will likely not pose potentially high health hazard risks of land based transmission facilities

Assure HR 1555 states that for at least 7 years, local jurisdictions shall be allowed local control and to have more protective standards, and then the need for FCC pre-emption can be revisited by Congress.

The Office of Technology Assessment (now defunct) reported in August 1995 that

"Later this year (1995), American Mobile Satellite Corp. (AMSC) is expected to begin providing a more advanced mobile satellite service in the United States....AMSC plans to market its services as an extension of terrestrial cellular telephone systems, primarily targeting the mobile user market.... "A new generation of mobile satellite services is expected to become operational in the late 1990s. Instead of using a small number of geostationary satellites like those employed in the Inmarstat and AMSC systems, these new systems will consist of a constellation of many smaller satellites in low Earth orbit (LEO) Because the satellites orbit close to the Earth, LEO systems **permit the use of a low-power handheld device about the same size as a portable cellular phone."**

"The Globalstar system design calls for a network of 48 satellites. .Service is **scheduled to begin in 1998** with a company-projected market of 2.7 million users by the year 2002..." [Wireless Technologies and the National Information Infrastructure, Office of Technology Assessment, Chapter 3, page 76, 77, 78, August 1995, OTA-ITC-622]

A very large system of principal partners Gates and McCaw is called "Teledisc" has a design that calls for "a constellation of **840 satellites in low earth orbit.**" [OTA above report, page 165]

Congress needs to ask, given all of these satellite systems which are designed to fill gaps in ground-based system, is it really necessary or even prudent for Congress to manipulate and constrain free market forces, showing partiality and favoritism by compelling residential and school areas that would likely prefer satellite service "products", to be forced to accept ground-based mobile transmission "products" which may be visually distracting, lower property values and potentially harmful? Such Congressional action could thus restrict potential satellite markets. Why do this when much far lower power signal satellite technology services is imminent.

"Many analysts do not believe that there are enough customers to support all of the proposed systems." [OTA, page 80]
"The bad news: Skeptics say cellular will be everywhere it's needed by the time the space phones are turned on."
[USA Today November 21, 1995, page B1 and B2]

Moreover, if some low-dose long-term radiofrequency animal studies finding cancer promotion, fetal malformation, and brain damage are valid for humans, then nations which wait and rely more on satellites for telecommunications by homes and schools may be healthier and have lower health costs for government and businesses, and, thus, be more competitive.

DETAILS

Section 107 of HR 1555 states that the Federal Communications Commission shall,

"...prescribe and make effective a policy regarding State and local regulation of the placement, construction, modification, or operation of facilities for the provision of commercial mobile services."

It also states that,

"...no State or local government or any instrumentality thereof may regulate the placement, construction, modification, or operation of such facilities on the basis of the environmental effects of radio frequency emissions, to the extent that such facilities comply with the Commission's regulations concerning such emissions."

Let's ask, "How safe is the protection which Congress and the FCC intend to provide?"

The House Bill HR 1555 in Section 107 also specifies that the FCC, "**...shall complete action in ET Docket 93-62 to prescribe and make effective rules regarding the environmental effects of radio frequency emissions.**" '**ET Docket 93-62**' refers to FCC proposal to adopt the 1992 radio frequency health standards of the American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers (IEEE), both private organizations.

However, the U.S. Environmental Protection Agency (EPA) has written,

"EPA recommends against adopting the 1992 ANSI/IEEE standard because it has serious flaws that call into question whether its proposed use is sufficiently protective of public health and safety. ..The thesis that the 1992 ANSI/IEEE recommendations are protective of all mechanisms of interaction is unwarranted because the adverse effects level in the 1992 ANSI/IEEE standard is based on a thermal effect (e.g. of heating tissue)" [from letter of November 1993 from M. Oge, then EPA Director of Radiation and Indoor Air, to Thomas Stanley, FCC Chief Engineer]

One reasons there are "unwarranted" claims in the ANSI standard is that a majority of the members on the ANSI committee "**could not muster the 2/3 (two-thirds) majority needed to delete**" many of the unwarranted claims that a sub-committee recommended. Thus, a minority kept clauses which the majority found false or otherwise inappropriate. [Microwave News September/October 1993, article: "Revising ANSI RF/MW Limits: Debate Often Contentious"]

In addition, the standards of the International Radiation Protection Association (IRPA) are somewhat more strict than the exposure limits of the ANSI standard. Yet this standard warns,

> **"In view of our limited knowledge on thresholds for all biological effects, unnecessary exposure should be minimized."** [IRPA Guidelines on Protection Against Non-ionizing Radiation, 1987 radio frequency standard]

Indeed, the ANSI standard itself acknowledges that,

"...most reports of biological effects have embodied acute (e.g. short term) exposures at relatively few frequencies ....(and that there is) "... *a paucity of reliable data on chronic exposures*" (ANSI, 1992, Sec 6.4 Assessment Criteria)

Therefore, the ANSI standard HR 1555 forces on American communities is not based on chronic exposures.

Indications of Actual Adverse Health Effects

Overview:

o **Encyclopedia Britannica reports,**

> "Radio waves of far less power (microwatts per square centimeter) than the 10-20 milli-watts per square centimeter needed to produce heating in living tissue can have **adverse effects on the electrochemical balance of the brain and the development of a fetus** if these waves are modulated or pulsed at low frequencies between 5 and 100 hertz (between 5 and 100 times per second), which are of the same magnitude as brain wave frequencies." [The New Encyclopedia Britannica, Vol. 18, 1991, Electromagnetic Radiation, Microwave section, page 202]

o **"Biological Effects of Microwave Radiation: A White Paper", by past Chief of the biological effects group of the Philips Laboratory's Electromagnetic Effects Division at Kirkland Air Force Base, Dr. Cletus Kanavy** in Microwave News, September/October 1993. He notes,

"...studies of humans under occupational conditions report marked functional and biochemical changes, under the chronic influence of microwaves at power densities ranging **from fractions of microwatts** to a few milliwatts." [page 12] [Note: the proposed 1992 ANSI standard for many cellular telephone transmission antennas is about 590 microwatts, many fold more than "fractions of microwatts", and also many fold the exposures now beginning to occur in our cities as antennas heights shrinking to under 50 feet, [see Seattle, Washington Planning Dept. sites Laurelhurst, Ravenna, and Edgewater with predicted maximum exposure to the population of 23, 30, and 62 microwatts per square centimeter. Note this is **4 fold, 6 fold and 12 fold the exposures to the U.S. Moscow embassy** from 1953-1975 and where cancer incidence was quoted as being "the highest in the world" (see details below)

o **"Potential and Actual Adverse Effects of (cellular telephone) Cellsite Microwave Radiation", by** Dr. Neil Cherry, Director, Climate Research Unit, P O Box 84, Lincoln University, Christchurch, New Zealand, April 1995 [e-mail CHERRY@KEA.Lincoln.ac.nz]

- Miscarriage rates increase suggests 'protection limit' 11,800 fold *lower* than ANSI 1992 mandated by HR 1555

Dr. Cherry reviews studies of physical therapists who give microwave heat treatments and who were found to have 47% miscarriage rates. From these studies he estimates that if a 10 fold 'safety' factor were used that appropriate protection limits would be **0.05 microwatts per square centimeter; this is 11,800 fold times lower** than the "safe" level of about 590 microwatts per square centimeter applicable to cellular transmission in the ANSI standard proposed in Section 107 to force on our nation's cities. Yet, it is still 10 times higher than the median exposure level of 0.005 microwatts per sq. cm. as measured in American cities [Federal Register, Vol 51,No 146, July 30, 1986 page 27323]

- Cancer rate increases at the U.S. Embassy in Moscow

Dr. Cherry reviews a recent review of Dr. J.R. Goldsmith of the public records of U.S. Moscow Embassy while it was irradiated 23 years with low levels of microwave radiation. The levels from 1953 through May 1975 **did not exceed 5 microwatts per square centimeter**, and from June 1975 through Feb. 1976 did not exceed 18 microwatts per square centimeter [Table 5-30, Biological Effects of Radiofrequency Radiation, 1984, EPA-600/8-83-026F]. The Goldsmith review found,

"...a statistically **significant increase with white blood cell counts**, mean hematocrit increased and a threefold increase in monocyte count, while neutrophil percentage fell and then rose and the reverse occurred for lymphocytes. There were **raised cancer deaths (15 out of 31 women staff), including leukemia, female genitalia cancer and child cancer. Adult dependents showed 5 malignant neoplasms compared with 1.5 expected** and dependent **children showed greater than expected anemia.**" [pg 16. Cherry report]

The author Paul Brodeur in his book, The Zapping of America, reported that immune system white blood cell called lymphocytes

"**...ran 44% above normal in 64 out of 213 American diplomats and their dependents who were tested...** (and that) ..

"Zbigniew Brzezinski, Polish-born national security adviser to President Carter, told this reporter (Paul Brodeur) in March 1976, in Tokyo, that the **cancer rate among Americans in the Moscow embassy was the highest in the world.**" [The Zapping of America, W.W.Norton & Co. 1977, page 128, 129]

Please note that the 3 previously mentioned engineering reports of predicted exposure levels in Seattle Washington area neighborhoods are 4 to 12 fold times higher (20 to 60 microwatts per square centimeter) than the 5 microwatt per square centimeter irradiation of the Moscow American embassy from 1953 to May 1975 [see Table 5-30 in Biological Effects of Radiofrequency Radiation, 1984, EPA-600/8-83-026F]. Thus, Americans in the U.S. are being exposed to levels much higher than the radiation by the Soviets of Americans at the U.S. Moscow embassy.

The association of radiation of the U.S. Moscow embassy and high cancer rates does NOT prove a cause and effect relation. But it does lend some support to the concern that the relation may be causal. Moreover, 4 out of 4 long term low-dose animal studies show an association between cancer and radiofrequency, as described in a World Health Organization review, 1993 (see below), thereby further supporting that the Moscow association may be causal.

Therefore given the above associations of serious disease with low level radiofrequency, legislators might wish to be especially cautious, and not restrict local jurisdictions from making more protective measures that which the FCC shall decide.

ANIMAL STUDIES

- CANCER

o A cancer association was found in all 4 out of 4 animal studies of long term low level exposure noted in the World Health Organization 1993 Environmental Health Criteria: Electromagnetic Fields report #137

4 animal studies of long term exposure (more than 2 months) to radiofrequency radiation and at levels deemed "safe" for animals by the ANSI 1992 standard (below 4 Watts of power absorbed per kilogram of body weight) were reviewed by the World Health Organization Environmental Health Report #137 Electromagnetic Fields (1993).

Yet, ***all 4 out of 4 studies found a positive association with increased cancer.*** Of these, one study at the University of Washington (Guy et al.) with100 exposed and 100 control animals found a more than 3 fold increase of malignant neoplasms; and it was at a level1/10th of the limit ANSI 1992 declares "safe" for animals, ***and equal to the level ANSI 1992 declares "safe" for human occupational exposures.*** The study found:

1. **Increased primary malignant tumors in the aggregate from all sites, even though no excess in any one site *(18 for exposed vs 5 for controls)***

The Environmental Protection Agency has determined that,

"A statistically significant excess of tumors of all types in the aggregate, in the absence of a statistically significant increase of any individual tumor type, should be regarded as minimal evidence of carcinogenic action unless there are persuasive reasons to the contrary." [EPA Federal Register September 24, 1986, page 33995]

Thus, this finding is of biological significance by the EPA, and is evidence for cancer, although minimal evidence.

Moreover, the Food and Drug Administration Center of Device and Radiological Health (CDRH) has commented on this study stated,

"Although this study has been discounted by some critics because no one tumor site or target organ predominated, this is **precisely what one would expect for an agent which accelerates the progression of naturally malignant cells.** That is, any transformed neoplastic group or cells occurring in an organ will be **promoted without preference** as to site or type of cancer." [Appendix 5 in Potential Public Health Risks From Wireless Technology, August 1994, Scientific Advisory Group on Cellular Telephone Research]

In addition, while there was no single site with an excess of malignant tumors, some reviewers of this study found related organs or types of tumors had significantly higher malignancies, namely:

2. **Increased benign pheochromocytoma of the adrenal medula (7 of exposed vs 1 of controls)**
3. **Increased malignant tumors at all sites (54 malignancies of exposed vs 23 of controls)**
4. ***Increased carcinomas at all sites (11 of exposed vs 2 of controls)***
5. ***Increased glandular carcinoma for combined endocrine glands (8 exposed vs 1 control)***

(includes adrenal cortex and medulla, thyroid, liver, pituitary, testes, epididymis, and pancreas)

[The above #2 to # 5 increases are noted by a reviewer in a final report by the Scientific Advisory Board of the Environmental Protection Agency, Report EPA-SAB-RAC-92-013, January 1992, Appendix B, page 2, actual counts derived from Guy et al., Long-term, Low-level microwave irradiation of rats, Bioelectromagnetics 13:469-496, 1992]. Each of #2 to #5 above was reported in the above EPA report to have the probability to occur by chance being less than 3 in 100.]

6. ***Some increased malignancies of the hemato-immunologic system (all forms of leukemias and lymphomas) (31 of exposed vs 19 for controls)*** [noted in S.Szmigielski et al, in Modern Bioelectricity, ed. A. Molino, published by Marcel Deckker, Inc. New York, 1988, page 901]

o **Data "strongly suggests" that microwaves can accelerate the development of cancer writes the Food and Drug Administration (FDA) Center for Devices and Radiological Health** which referred to the above 4 studies and others when it wrote, that while there are few low radiofrequency dose long term animal studies on cancer, that

"The fact remains, however, that the data which exists **strongly suggests that microwaves can, under at least some conditions, accelerate the development of malignant tumors.**" [Letter of FDA, Center of Device and Radiological Health to the Scientific Advisory Group on Cellular Telephone Research (now Wireless Telephone Research), in Potential Public Health Risks From Wireless Technology, August 1994, 1711 N Street, N.W. Washington D.C., telephone: (202) 833-2800]

Risks of cancer relevant even at the very low exposure levels from mobile telecommunications facilities:

Some industry lobbyists may argue that because population exposure levels from cellular telephone base station antennas are expected to be below the exposure levels of the above studies that any possible association with cancer, even if true, is irrelevant. This above telecommunications industry argument is contrary to the experience and assumptions used by the U.S. Environmental Protection Agency which states,

"Based on extensive scientific evidence, EPA believes it prudent to assume that carcinogens, including radionuclides, pose a risk of health effects *even at low levels of exposure*. Based on this scientific policy judgment, EPA calculates health risk estimates assuming that the risk of incurring either cancer or hereditary effects is linearly proportional to the dose received in the relevant tissue. [Environmental Protection Agency 40 CFR Part 61, in the Federal Register, December 15, 1989, page 51659]

o **About 50% birth loss and fetal incomplete development**

There was only one study (Tofani et al. page 145) in the World Health Organization (WHO) report #137 mentioned above of radiofrequency effects on birth loss and fetal development at or below levels at which people may be exposed to in their homes due to cellular phone antennas (and 20 fold below the 3 Seattle examples given above), and 1/700th the level deemed "safe" for the general population. The study found that pregnant animals exposed to radio frequency radiation had 50% fewer viable fetuses than unexposed animals. Also, of the viable fetuses, over 50% of the exposed fetuses had incomplete cranial (skull) development. [details in S. Tofani et al, Effects of Continuous Low-Level Exposure To Radiofrequency Radiation On Intrauterine Development In Rats, Health Physics, Vol. 51, No. 4, page 489-499, 1986]

o **Blood Brain Barrier damage found pathological** when laboratory animals were exposed to 915 MHz, a radiofrequency close to cellular phones, and at 1/250th the power level deemed safe for animals, and 1/5 th the level now deemed "safe" for the general population. Authors report damage to this brain barrier can "lead to cerebral edema, increased intracranial pressure, and in the worst case, irreversible brain damage."
[L. Salford et al, Permeability of the Blood Brain Barrier Induced by 915 MHz Electromagnetic Radiation, Continuous Wave and Modulated at 8, 16, 50, 200 Hz, Microscopy Research and Technique, Vol 27:535-542, 1994]

o **Interference with Hearing Aids and Sensitive Medical Devices**: In an FCC petition the FCC, the counsel of HEAR-IT-NOW (filed June 5, 1995) shows mobile base station facilities can cause interference with hearing aids at cellular frequencies. Included, is an article by J.Short, of BT Laboratories, Mrtlesham Heath, Ipswich, England, where he states, **"The critical field strength is around 4 Volts per meter for perceptible, annoying interference."** Similar findings of potential interference from base stations is reported in the above petition and includes research by New Zealand Audiology Centre, Telecom Denmark, and Telecom Research Laboratories of Australia. Also, the Office of Technology Assessment Report notes the International Electrotechnical Commission has reduced suggested immunity to just 3 volts per meter [OTA, August 1995 as above, page 253]. The 3 Seattle locations given above all exceed this limit, showing that cellular base station levels can interfere with hearing aids and medical devices. Now that mobile antenna facilities are penetrating from rural and industrial areas into residential areas, more interference problems may occur.

o **Possible potential for dramatically increasing cancer rates in America by decreasing production of nighttime melatonin:** Radiofrequency signals may, ***without causing "damage"***, act on the retina of the eye as "light" concerning signals the retina sends to the pineal gland. If so, these signals may potentially decrease the production of pineal gland night time melatonin which evidence suggests is protective against many cancers, including breast, prostate, and leukemia. Studies have shown that when the eye sees light of certain strength at night then melatonin levels decrease in both animals and humans. Also, non-visible ultra-violet light has been found to reduce melatonin in some animals. Hence, non-visible radio-frequency signals may also have this effect; and since these signals pass through walls of homes, ground based mobile transmission facilities may result in lower melatonin night production and in higher cancer rates. [See Biological Effects of Electric and Magnetic Fields, Academic Press, 1994, Vol. 1 Ch. 11, Vol 2, Ch. 12].

Conclusions:

- **Given the above please seek to delete parts of Section 107 of HR 1555 that**
  - **restrict local zoning,**
  - **pre-empt local environmental health protection codes more protective than FCC standards,**
  - **adopt the ANSI health standard in ET Docket 93-62 that EPA advises against adopting.**
- **Moran and Goodlatte amendment is an improvement, but needs further modification**

Please consider the Moran and Goodlatte amendment which seeks to restore some zoning control to local jurisdictions. However, this amendment still provides for preempting local jurisdiction control of environmental health standards concerning irradiation exposure. Modifications are needed to restore the freedom of States and local jurisdictions to set more protective standards. **Would your constituents want this local control to remain?**

- While satellite systems are established, stipulate that for 7 years the FCC shall not interfere with local jurisdiction control; later the need for government regulation to fill gaps in universal service can be revisited.

- Provide more funding to specifically study health effects from land-based mobile transmission facilities.

#3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 09 1993

OPTIONAL FORM 99 (7-90)
FAX TRANSMITTAL # of pages ▶ 12

To Rick Poston	From Shelly Rosenblum
Dept./Agency	Phone # 415-744-1047
Fax #	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Thomas P. Stanley, Chief Enginee:
Office of Engineering and Techno:
Federal Communications Commissio:
Mail Stop 1300
1919 M Street, N.W.
Washington, D.C. 20554

Dear Dr. Stanley:

In accordance with its responsibilities under Section 309 of the Clean Air Act (CAA), the Environmental Protection Agency (EPA) is pleased to submit comments to the Federal Communications Commission (FCC) on the Notice of Proposed Rulemaking (NPRM), Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, ET Docket No. 93-62. The CAA responsibilities have been delegated from the Office of Federal Activities to the Office of Radiation and Indoor Air for this specific review. This proposal, if adopted, would use the 1992 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) standard to update and amend the FCC guidelines for evaluating the environmental effects of radiofrequency (RF) radiation emitted by FCC-regulated facilities on public health and safety.

The 1992 ANSI standard represents a significant revision of the earlier 1982 ANSI standard. Improvements with regard to protection are reflected in (1) the development of a 2-level exposure standard specifying maximum permissible exposure (MPE) limits for "controlled" and "uncontrolled" environments to replace the single-tier 1982 standard, and (2) the extension of the low frequency range from 300 kHz to 3 kHz to limit the possibility of low-frequency RF shock and burn. Other significant changes in the 1992 standard, however, are not improvements, in our view. Changes that allow for a two-fold increase in the MPE at high frequencies ~~over the MPE permitted~~ by the 1982 ANSI standard, and the application of the same MPE for both controlled and uncontrolled environments for frequencies from 15 GHz to 300 GHz are not improvements. Therefore, EPA recommends against adopting the 1992 ANSI/IEEE standard because it has serious flaws that call into question whether its proposed use is sufficiently protective of public health and safety.

To have a more protective public exposure standard, EPA recommends that the FCC instead adopt the exposure criteria

recommended earlier by the National Council on Radiation Protection and Measurements (NCRP) in their report entitled "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields (NCRP 1986)." The bases for this recommendation are noted below:

a. NCRP's RF radiation exposure limits consider both workers and the public.

b. Their exposure criteria are more protective at higher frequencies.

c. There are no substantive differences in the literature base supporting both standards, except for the literature on RF shocks and burns.

d. NCRP is chartered by the U.S. Congress to develop radiation protection recommendations and is recognized as one of the leading authorities in this area.

In addition, EPA recommends that the FCC consider including limits for induced and contact RF currents for the frequency range of 300 kHz to 100 MHz to protect against shock and burn along with the FCC proposal for low-power device exclusions as modified in the attachment to this letter. The Agency believes these recommendations provide a more protective alternative to the 1992 ANSI/IEEE standard. The basis for EPA's recommendations are provided in the detailed comments in the enclosure to this letter.

Furthermore, the Agency recommends that the FCC consider requesting the NCRP to revise its 1986 report and provide an updated, comprehensive report on the biological effects of RF radiation and recommendations for exposure criteria. EPA endorses such a request as reasonable and appropriate.

In summary, EPA recommends the following:

1. <u>The FCC should not adopt the 1992 ANSI/IEEE standard</u>. There are serious flaws in the standard that call into question whether the proposed use of the 1992 ANSI/IEEE is sufficiently protective. The following four points address several key Agency concerns.

a. The 1992 ANSI/IEEE <u>allows a two-fold increase</u> in the MPE at high frequencies above that permitted by the current FCC guideline.

b. The two-level revised standard is not directly applicable to any population group but is applicable to exposure environments called "controlled" and "uncontrolled" environments

that are not well defined and are discretionary. The Agency disagrees with this approach.

c. The 1992 ANSI/IEEE conclusion that there is no scientific data indicating that certain subgroups of the population are more at risk than others is not supported by NCRP and EPA reports.

d. The thesis that the 1992 ANSI/IEEE recommendations are protective of all mechanisms of interaction is unwarranted because the adverse effects level in the 1992 ANSI/IEEE standard is based on a thermal effect.

2. The FCC should consider the exposure criteria recommended by the NCRP in NCRP Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," with the addition of:

a. the 1992 ANSI/IEEE limits for induced and contact RF currents, for the frequency range of 300 kHz to 100 MHz, to protect against shock and burn, and

b. the FCC proposal for low power device exclusions (FCC 93-142, pp. 7-8) as the standard for the public, where the definition of "public" includes all persons using these devices unless the user is operating a device as a concomitant of employment.

3. The FCC should consider requesting the NCRP to revise its 1986 report to provide an updated, comprehensive review of the biological effects on RF radiation and recommendations for exposure criteria.

More specific comments are enclosed for your consideration. We appreciate the opportunity to comment on the the FCC proposal. If you have any questions concerning EPA's comments, please feel free to contact Norbert Hankin in the Radiation Studies Branch at (202) 233-9235.

Sincerely,

Margo T. Oge

Margo T. Oge
Director, Office of Radiation
and Indoor Air

Enclosure

Environmental Protection Agency (EPA) Comments to the Federal Communications Commission (FCC) on FCC 93-142, April 1993, Notice of Proposed Rulemaking; Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation.

Introduction

The FCC currently uses the 1982 ANSI (American National Standards Institute, Inc.) radiofrequency (RF) radiation guidelines for evaluating the environmental effects, particularly on public health and safety, of RF radiation emitted by FCC regulated facilities. In November 1992, ANSI adopted a revised standard now known as ANSI/IEEE C95.1-1992 (IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, IEEE C95.1-1991). The FCC now proposes to amend and update the guidelines and methods that it uses to evaluate the environmental effects of RF radiation by adopting the new ANSI/IEEE standard. The 1992 recommendations contain a number of significant changes when compared to the 1982 single-level guideline based on a 10-fold safety factor. The revised guideline is a two-level standard, i.e., it contains two sets of exposure limits, one for the controlled environment and one for the uncontrolled environment, incorporating safety factors of 10 and 50, respectively. Another change is the extension of the frequency range from 300 kHz - 100 GHz to 3 kHz - 300 GHz. In addition, 1992 ANSI/IEEE allows a two-fold increase in the MPE at high frequencies above that permitted by the 1982 ANSI standard.

EPA welcomes the opportunity to comment on the FCC proposal and to address the complexity and what we believe are the limitations of ANSI/IEEE C95.1-1992. EPA review of 1992 ANSI/IEEE leads us to believe that it is a standard with flaws that cast doubt about whether it is sufficiently protective of public health and safety, and its claim that "the recommended exposure levels should be safe for all."

EPA comments on the FCC proposed standard address: derivation of standards; the claim of protection for all persons from all interaction mechanisms; controlled and uncontrolled environments; database limitations; modulation; low-power devices; and, other contemporary exposure standards.

Discussion

Approach to Derivation of Standards

The rationale provided in ANSI/IEEE to explain fundamental characteristics of the 1992 ANSI/IEEE guidelines, in many cases, lacks explanation, consistency, and well-founded justifications. In addition, there is concern that the complexity of the 1992 ANSI/IEEE standard may make it difficult to comply with or effectively enforce.

No explanation is given for the decision to employ safety factors of 10 and 50; there is no discussion that supports the introduction of the standard for the "uncontrolled" environment. In fact, the stated conclusion that "the recommended exposure levels should be safe for all" (at the controlled environment working basis of 0.4 W/kg) and the support given for this conclusion in the standard's rationale constitute an argument for a single-tier, not a two-tier standard. The addition of the second level of protection for exposure in an

uncontrolled environment with the application of an additional safety factor is done without any justification.

When available, human data is preferable to laboratory animal data in standards development. Therefore we consider the 1992 ANSI/IEEE guidelines to be deficient in this area because reports published after 1986 that presented human data were not considered. We would expect that future efforts to develop or update RF radiation standards would include analysis of available human thermophysiological information and models.

Claim of Protection for All Persons from All Interaction Mechanisms

The new ANSI/IEEE standard states that the "intent was to protect human beings from harm by any mechanism, including those arising from excessive elevations of body temperature" (IEEE p.27), i.e., the 1992 ANSI/IEEE standard is purported to be protective of all persons and all interaction mechanisms. We believe that this position has not been supported, as shown by the following discussion.

In the 1992 ANSI/IEEE standard, as well as in the 1986 NCRP guidelines, the biological basis for maximum permissible exposure level varies with frequency. In the frequency range from 100 kHz to 6 GHz, maximum permissible exposure levels are based on whole-body averaged SAR (specific absorption rate expressed in watts per kilogram of body mass, W/kg). More specifically, the working threshold for unfavorable biological effects in human beings in the frequency range from 100 kHz to 6 GHz is defined as 4 W/kg. Safety factors of 10 and 50 were used to derive the maximum permissible exposures for controlled and uncontrolled environments, respectively.

This adverse effect level for human beings, 4 W/kg, is the threshold for a specific biological effect, i.e., behavioral disruption (work stoppage) in nonhuman primates that is associated with an increase in body temperature. Work stoppage, the failure of a food-deprived animal to perform a learned task to gain a food reward, is interpreted to result from thermal stress, caused by the absorption of RF energy, that is sufficiently severe to deter hungry animals from working for food.

Since the ANSI/IEEE hazard level is an SAR associated with an effect resulting from a known mechanism of interaction (RF heating) that is associated with an increase in body temperature (as is the NCRP hazard level), the ANSI/IEEE C95.1-1992 standard is based on a thermal effect of RF radiation and, by extension, is protective of effects arising from a thermal mechanism, but not from all possible mechanisms. Therefore, the generalization that 1992 ANSI/IEEE guidelines protect human beings from harm by any mechanism is not justified.

In contrast to the 1992 ANSI/IEEE standard, 1986 NCRP states that a response to RF radiation may have a "thermal basis, an athermal basis, or a combined basis," and that a "determination of which of these three classes of causation is operative in a given context rests upon appropriate experimentation and inference, not presumption." NCRP

also claims that there is "no intent to define exposure criteria solely in terms of SAR," and that "consideration is also given to other factors where appropriate." These factors include, among others, possible modulation- and carrier-frequency specific biological responses.

Exposure Environments - Controlled and Uncontrolled

EPA believes that the proper approach in defining exposure environments to which guidelines are applied should be in terms of the populations to be protected, i.e., the traditionally defined populations being workers and the public. However, the ANSI/IEEE standard takes a different approach.

The 1992 ANSI/IEEE standard recommends exposure limits for a controlled environment and an uncontrolled environment. Controlled environments are defined as locations where exposure may be incurred by persons who are aware of the potential for exposure or as the result of transient passage. Uncontrolled environments are locations where exposures may be incurred by persons who are unaware of the potential for exposure. In the uncontrolled environment, an additional safety factor is applied for exposure in the resonant frequency range and for low-frequency exposure to electric fields. As defined in the standard, controlled environments are discretionary, i.e., identification of controlled environments is at the discretion of the operator of a source (see IEEE, p. 9, footnote 1).

The 1992 ANSI/IEEE standard states clearly that the distinction between the two exposure environments is based on the nature of the exposure environment and not on the population type (see IEEE 1991, p. 23). ANSI/IEEE does not allow for any variation in sensitivity to RF radiation. It states that there is no reliable evidence that certain subgroups of the population [such as infants, aged, ill and disabled, persons dependent on medication, persons in adverse environmental conditions (excessive heat and/or humidity), voluntary vs. involuntary exposure] are more at risk than others (IEEE 1991, p. 23). This conclusion is not in agreement with conclusions in the EPA report "Biological Effects of Radiofrequency Radiation" (EPA 600/8-83-026F, 1984) or in the NCRP Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields" that the general population has groups of individuals particularly susceptible to heat.

Other contemporary guidelines agree with NCRP and EPA; the Food and Drug Administration (FDA) 1988, National Radiological Protection Board (NRPB) 1991, International Radiation Protection Association (IRPA) 1991, and the International Electrotechnical Commission (IEC) 1993, guidelines define groups of people who are less heat tolerant than others. These include the elderly, infants, pregnant women, and people who are obese, have hypertension, or take drugs such as diuretics, tranquilizers, sedatives, or vasodilators that decrease heat tolerance.

The basis for the ANSI/IEEE guideline in the frequency range of 0.1 MHz to 6.0 GHz, the frequency range in which most of FCC licensed transmitters operate, is an effect due to RF heating. Since, as mentioned above, the general population contains individuals

particularly susceptible to heat, we recommend against the use of controlled and uncontrolled environments and recommend consideration of 1986 NCRP as a means of avoiding this problem.

We strongly disagree with the use of the concepts of control and awareness in the discretionary manner presented in '92 ANSI/IEEE. In the standard there are no firm rules given to differentiate between controlled and uncontrolled environments, and therefore the concept will be difficult to apply because people seldom agree on discretionary areas of exposure. The standard could be applied arbitrarily and inconsistently since ANSI/IEEE does not impose conditions to describe or create the state of awareness. An individual's degree of awareness could vary from complete understanding of RF sources to only a vague awareness that RF radiation exists in his controlled environment.

If awareness in a controlled environment can vary from complete knowledge to almost no knowledge, then the degree of control over safety is uncertain. Unspecified awareness in itself does not constitute a controlled situation. A controlled environment could be established with measures imposed to ensure strict adherence to the standard to prevent the possibility for exposure of any individual in the controlled environment to exposures greater than recommended by the standard. However, 1992 ANSI/IEEE does not recommend the actions that should be taken to establish a controlled environment, and if it would, it could not provide the authority for control. In our view, "awareness" is not equivalent to protection.

The FCC proposal (paragraph 13) presents a reasonable way to apply the guidelines to the public that is more consistent with traditional definitions of workers and the public. This is also the method used in the 1986 NCRP exposure criteria. NCRP recognizes that there is variability in human response, that there are categories of individuals with susceptibilities that place them at greater risk for potential harm, and that workers, who may be relatively well informed of potential hazards of RF radiation exposure, may have the opportunity to make personal decisions in regard to their exposure. Therefore it is appropriate for the FCC to adopt this approach to apply the more conservative guidelines where there is any question of possible exposure of the general public (which might also include nontechnical employees) to RF radiation, and to apply the more restrictive exposure limits to any transmitters and facilities that are located in residential areas or locations where the RF source may be accessible to the public. We suggest that the phrase "accessible to the public" replace the word "unrestricted" in the FCC proposal because the former phrase more accurately describes the locations.

Limitations of data

Availability of chronic exposure information

It is clear that the adverse effect threshold of 4 W/kg is based on acute exposures (measured in minutes or a few hours) that elevate temperature in laboratory animals including nonhuman primates, and not on long-term, low-level (non-thermal) exposure. Only a few chronic exposure studies of laboratory animals and epidemiological studies of human populations have been reported. The majority of these relatively

few studies indicate no significant health effects are associated with chronic, low-level exposure to RF radiation. This conclusion is tempered by the results of a small number of reports suggesting potentially adverse health effects (cancer) may exist (e.g., Szmigielski - Bioelectromagnetics 1982; Chou - Bioelectromagnetics 1992; Milhc - NEJM 1982, Lancet 1985, Am. J Epid. 1988). A determination of the significance of such potential adverse effects awaits independent confirmation of the experimental results.

The limitations of the data used to define the adverse effect level in the 1992 ANSI/IEEE recommendations do not support the claim that the recommended MPEs in 1992 ANSI/IEEE are protective of all mechanisms and all people.

Publication Cut-off Date

The 1992 ANSI/IEEE standard is based on literature published before 1986, except for a few papers on RF shock and burn. The cut-off date for the literature review supporting the NCRP recommendations is 1982. Even though the 1992 ANSI/IEEE guidelines had more recent data for consideration than did 1986 NCRP, the recommendations are basically similar for the resonant frequency range in that both use work stoppage at 4 W/kg as the adverse effect basis for standard setting and also safety factors of 10 and 50 to establish two levels of MPE. Therefore it cannot be argued that the 1992 ANSI/IEEE standard is preferable because it is based on more recent information except for the recommendations on shock and burn. Although the Agency believes the ANSI/IEEE standard to be generally deficient, EPA concurs with the FCC proposal to adopt the 1992 ANSI/IEEE standard with respect to exposure limitations for shock and burn.

Extremely Low Frequency (ELF)-Modulated RF Radiation

As noted in the FCC proposal (paragraph 25), the NCRP guidelines include a special provision with respect to exposure of workers to RF carrier frequencies modulated at ELF frequencies. This recommendation is apparently based on experimental results showing neurophysiological effects of modulated fields. The modulation provision for workers in the NCRP guidelines is unique; no other RF exposure guideline contains such a provision. For certain modulation conditions, the exposure criteria for occupational exposures is the generally 10-fold more stringent general population exposure criteria.

While studies continue to be published describing biological responses to nonthermal ELF-modulated RF radiation, the effects information is not yet sufficient to be used as a basis for exposure criteria to protect the public against adverse human health effects.

Pulse-modulated vs. continuous-wave (CW) RF radiation

Many other studies provide evidence that nonthermal modulated-RF exposures produce effects that are not produced by CW (unmodulated) RF radiation. Meaningful studies of biological and health effects of nonthermal, pulse-modulated RF radiation exist including studies that show injury to the eye (Kues et al., Johns Hopkins Applied Physics Laboratory (JHAPL). The significance of these results, even at the early stages of this continuing research, was responsible for the

development and adoption of an RF radiation exposure standard by JHAPL (in 1984) for their personnel. The JHAPL MPE for frequencies from 30 MHz to 100 GHz is 0.1 mW/cm^2. This standard provided the basis for the 0.1 mW/cm^2 action level used to protect personnel from harm from RF radiation-generating equipment at the Hughes Aircraft Company. The JHAPL MPE is a factor of 100 times more stringent than the 1992 ANSI/IEEE MPE for controlled environments for the frequency range of 3.0 GHz and above.

Pulse-modulated RF radiation can produce a response that is called "microwave hearing". This effect seems well established and probably results from very rapid thermoelastic expansion of the brain, creating a sound wave in the head. Conditions under which the auditory effect can be invoked in people with normal hearing should be avoided according to the National Radiological Protection Board (NRPB) draft recommendations for workers and the public. In contrast to this recommendation, the 1992 ANSI/IEEE standard states that the human auditory effect is clearly not deleterious; it recommends a limit for pulsed radiation that is well above the threshold for the auditory effect.

Low-power Devices

We recommend that the two population groups, workers and the public, be used in the following suggested modifications to the FCC proposal regarding exposure to hand-held devices and amateur radio facilities (see FCC 1993, p.6, footnote 16). Non-users exposed to hand-held devices and amateur radio facilities should be considered as the public. Users of hand-held devices and amateur radio facilities should be considered as the public unless the user is operating a device as a concomitant of employment. This recommendation is based on the difficulty of differentiating between individuals who are cognizant or noncognizant of the potential for RF exposure and is consistent with the NCRP recognition of the two population groups, workers and the public. If NCRP is used, the problem of differentiating between cognizant workers and cognizant public would be avoided, and it would not be necessary to distinguish between users and non-users.

Other Contemporary Radiofrequency Radiation Guidelines

In addition to the differences identified and discussed between the 1992 ANSI/IEEE standard and the 1986 NCRP recommendations, there are significant differences between 1992 ANSI/IEEE and other contemporary RF radiation exposure guidelines, including those of the Food and Drug Administration (FDA), National Radiological Protection Board (NRPB), International Radiation Protection Association (IRPA), the International Electrotechnical Commission (IEC), and the Johns Hopkins Applied Physics Laboratory (JHAPL). The comments in this section address some of the differences.

The 1992 ANSI/IEEE guidelines are based on literature published before 1986 except for several papers on shock and burn. Other contemporary recommendations use more recent information and appear to be strongly influenced by clinical and modeling data describing thermoregulatory responses of patients and volunteers exposed in magnetic resonance imaging devices. As noted, the 1992 ANSI/IEEE adverse-effects level is based only on laboratory animal data.

The 1992 ANSI/IEEE standard claims that the recommendations protect against harm by any mechanism, that is, both thermal and nonthermal. It contends that chronic exposure data and information on nonthermal interactions are not meaningful for standards development. While there is general, although not unanimous, agreement that the data base on low-level, long-term exposure is insufficient to provide a basis for standards development, some contemporary guidelines state explicitly that their adverse-effect level is based on an increase in body temperature (NRPB 1993). Furthermore, they do not claim that the exposure limits protect against both thermal and nonthermal effects. EPA does not agree with the claim that the 1992 ANSI/IEEE guidelines protect against effects of any mechanism; we believe that the only claim that can be made is that the 1992 ANSI/IEEE standard applies only to thermal effects and electric shock.

Although several mechanisms of interaction of RF radiation with living systems have been proposed, the established and noncontroversial mechanism for acute exposures is heating. This is reflected in several guidelines for protection of patients from the physiological consequences of an increase in temperature due to exposure to RF radiation during magnetic resonance imaging procedures. These guidelines include: the 1988 FDA guidance, 1991 NRPB guidelines, the 1991 IRPA guidelines, and the 1993 draft IEC standard.

The 1993 NRPB draft recommendations for workers and the public state that restrictions on acute exposure to RF radiation of frequencies greater than 100 kHz are intended to avoid adverse effects resulting from whole-body and partial-body heating, and adverse effects resulting from pulsed RF radiation.

The 1992 ANSI/IEEE standard recommends limits for controlled and uncontrolled environments, using as its basis the position that the it is the nature of the exposure environment, not population type, that is important. This position is based partially on the conclusion that no reliable scientific data exists indicating that certain subgroups of the population are more at risk than others. However, other contemporary guidelines state the opposite conclusion. The FDA (1988), NRPB (1991), IRPA (1991), and the IEC (1993) guidelines define groups of people who are less heat tolerant than others. This information should be considered in development of an exposure standard.